APPENDIX D

COMMUNICATIONS

1. **General Instructions for the EFMB Test Board.**

The candidate will be required to complete the four performance tasks listed below and pass three of the four tasks. These tasks will be tested under simulated combat conditions in a battlefield scenario. To facilitate the simulated combat conditions, these tasks should be integrated into the survival and evacuation of the sick and wounded lanes. The task statements will be added to the lane briefing of the lane where the task will be tested.

2. **Objective.**

To measure the candidate's ability to install and operate field communication equipment under simulated combat conditions in a battlefield scenario.

3. **Tasks.**

a. Assemble and Operate a Field Telephone.

b. Assemble and Operate an FM Radio.

c. Enter a Radio Net and Authenticate.

d. Prepare and Transmit an Evacuation Request.

Section I

D-1. **Telephone Set TA-312/PT.**

a. The Telephone Set TA-312/PT is no longer limited to use with manual switchboards. It can be attached to a tone signaling adapter TA-955/PT which turns the telephone into a push-button, dial tone, two-wire, common battery subset capable of producing the standard dual tone signals used by military and commercial automatic-switching systems.

b. Telephone Set TA-312/PT (Figure D-1) is a small, rugged, water-proof, portable field telephone that was designed primarily for operation in the field on a local battery system. However, the telephone will also operate on a common battery system and common battery signaling system.

c. Telephone Set TA-312/PT (Figure D-2) may be installed on a tree or pole. Unfasten the carrying strap from the end farthest from the line terminals; place the telephone set against the support at a convenient height; wrap the carrying strap around the support and secure it to the ring in the case; insert a piece of field wire through the lower loop on the back of the canvas case and tie it securely around the support.

NOTE

TA-312 installed from aerial construction will have approximately six inches of slack to provide drip loop.

CAUTION

The line 1-2 binding posts must be up for proper positioning of the handset in its retaining brackets.

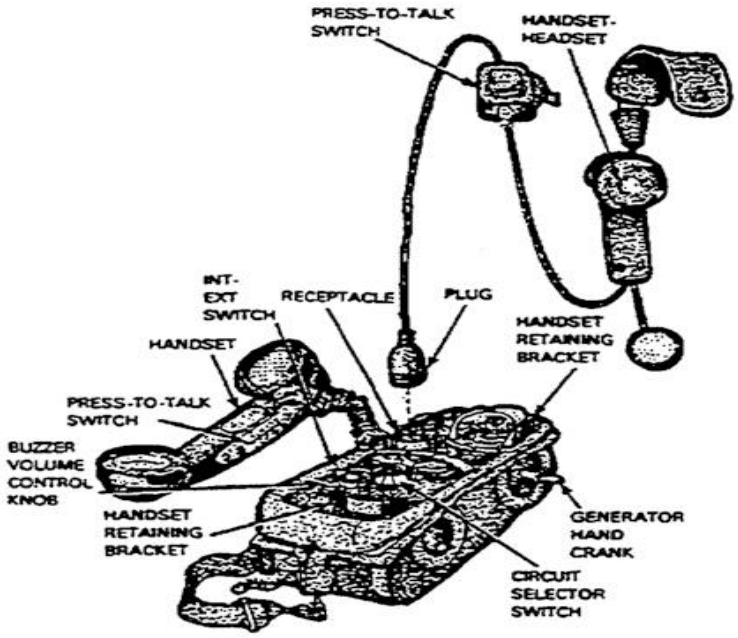


Figure D-1. TA-312/PT

(1) Remove about one inch of insulation from each wire of the pair to be connected (Field Wire WD-1/TT or WD-lA/TT). Strip 1/4-inch insulation and slide to the end of the wire as a keeper.

(2) Fold back the skinned portion of each wire about 1/2 inch.

(3) Push down on one of the line 1-2 binding posts, insert the bare end of one of the wires into the binding post slot, and release the pressure. Be sure the wire is clamped firmly. Repeat the procedure for the other wire and binding post.

(4) Tie the wire to the ring on the carrying case, and make a ground loop tie at the base of tree or pole.

(5) Operate the selector switch for the type of operation desire--local battery, common battery, or common battery signaling. Install two batteries (BA-30) in the battery compartment for local battery or common battery signaling.

(6) Figure D-2 shows condensed operating instructions for the Telephone Set TA-312/PT.

(7) When the telephone set is used as a desk set in a semi-permanent installation, the canvas case may be removed and stored for future use.

NOTE

For more detailed information refer to TM 11-5805-201-12.

WARNING

Soldiers may get a 90-volt shock if they touch bare wire when signaling.

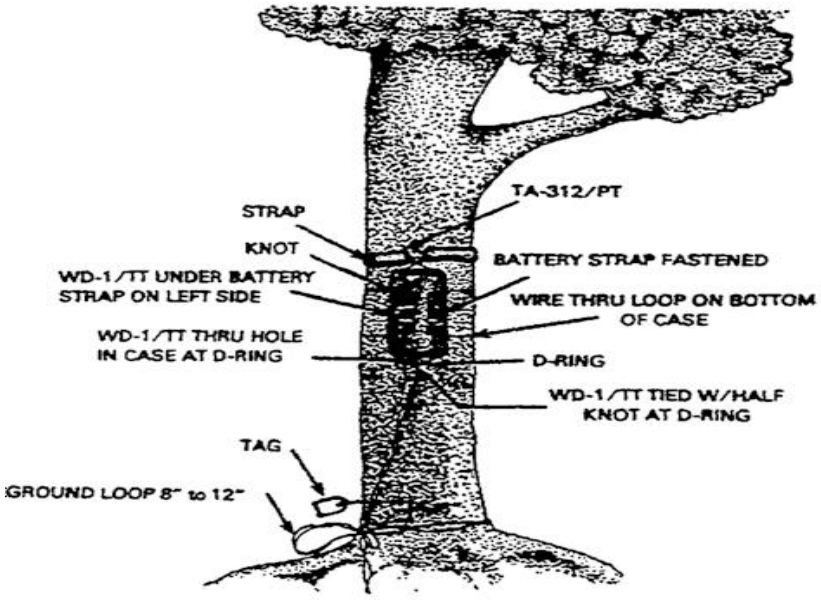


Figure D-2. TA-312/PT Installation

Section II

D-2. **General.**

a. This manual describes Radio Set AN/PRC-77 and covers its installation, operation, and operator's and organizational maintenance.

b. Maintenance allocation for the radio set is provided in Appendix B. A listing of components is provided in paragraph D-10 and Appendix C. Additional equipment authorized to operate the radio is listed in Appendix D.

c. Repair parts for organizational maintenance are provided in TM 11-5820-667-20P. Expendable supplies used for maintaining the radio are listed in Appendix E.

D-3. **Consolidated Index of Army Publications and Blank Forms.**

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

D-4. **Maintenance Forms, Records, and Reports.**

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy [ROD]) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73B/AFR 400-54/MCO 4430.3H.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) *(SF* 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 7518/MCO P4610.19D/DLAR 4500.15.

D-5. **Reporting Equipment Improvement Recommendations (EIR).**

If your AN/PRC-77 needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

D-6. **Administrative Storage.**

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to ensure operational readiness.

D-7. **Destruction of Army Electronics Materiel.**

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

D-8. **Hand Receipt Technical Manual.**

A Hand Receipt is available in Technical Manual (TM 11-5820-667-12). It contains preprinted DA Form 2062 (Hand Receipt/Annex No.) listing the AN/PRC-77 parts as given in section II of Appendix C. The Hand Receipt manual is published to aid property accountability and is available through: Commander, U.S. Army Adjutant General Publications Center, 2800 Eastern Blvd., Baltimore, MD 21220, in accordance with the procedures in Chapter 3, AR 310-2 and DA Pam 25-30. The Hand Receipt Technical Manual is entitled; Hand Receipt Manual Covering End Item/Components of End Item (COEI), Basic Issue
Items (BII), and Additional Authorization List (AAL) Related to
Radio Set AN/PRC-77. -

D-9. **Purpose and Use.**

Section III

DESCRIPTION AND DATA

a. Radio Set AN/PRC-77 is a man-pack, portable, frequency-modulated (FM) receiver-transmitter used to provide short-range, two-way, radio-telephone voice communication.

b. Receiver-Transmitter, Radio RT-841/PRC-77 is also used as part of Radio Sets, AN/VRC-64 and AN/GRC-160 (TM 11-5820-49812).

c. FM radio sets with which the AN/PRC-77 can communicate are listed in paragraph 3-11.

d. The AN/PRC-77 can also be used in conjunction with other equipment, (1) thru (7) below.

(1) Antenna Equipment RC-292 (TM 11-5820-348-15) and Antenna Group OE-254/GRC (TM 12-5985-357-13) can be used in place of the whip antennas to extend the communication range of the AN/PRC-77 (paragraph 6-3).

(2) The AN/PRC-77 can be connected to other FM radio sets for radio relay use by means of the cable in Retransmission Cable Kit MK-456/GRC (TM 11-5995-202-15 and paragraph 6-1). Such radios can be the AN/PRC-77, AN/PRC-25 (TM 11-5820-398-12); the vehicular versions of these radios: Radio Sets AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160 (TM 11-5820-498-12); and the AN/VRC-12 series radios (TM 11-5820-401-10 and TM 11-5820401-20).

(3) Remote control of the AN/PRC-77 can be provided by Radio Set Oak Control Group AN/GRA-39(*) (paragraph 6-7a) and Radio Set Control AN/GRA-6 (paragraph 6-9a).

(4) Radio/wire integration (RWI) operation with the AN/PRC-77 and remote telephone facilities can be provided by Radio Set Control AN/GSA-7 with Oscillator 0-574/GRA (paragraph 6-8). The AN/GRA-39(*) (paragraph 6-7b) and AN/GRA-6 (paragraph 6-9b) can also be used with the AN/PRC-77 for RWI operation.

(5) The AN/PRC-77 can be used with Antenna, Homing Loop AT-784/PRC (paragraph 6-4) for detection and location of homing beacons or other FM radios.

(6) The AN/PRC-77 can be used with Antenna AT-984A/G (paragraph 6-5), a long-wire, multiple wavelength antenna to extend the transmission and reception ranges.

(7) The RT-841/PRC-77 may be carried on a person's back using Pack Frame LC-2 (Figure D-7). The LC-2 is one configuration of a pack frame used for existence loads by ground troops.

D-10. **Technical Characteristics.**

Frequency range:

Low band.....30.00 to 52.95 MHZ ±3.5 kHz.

High band.....53.00 to 75.95 MHZ ±3.5 kHz.

Number of channels.....920.

Channel spacing.....50kHz.

Types of transmission and reception:
Transmission.....Voice (300 to 3,500 Hz) and 150 Hz squelch tone.
Reception.....Voice (no squelch) or voice and 150 Hz squelch tone.
Security or
digital data equipment.....Wideband (10 to 20,000 Hz) without 150 Hz squelch tone.

Transmission and reception power requirements:
  Transmission.....12.5 to 15 vdc, 780 ma average.
  Reception.....12.5 to 15 vdc, 0.06 amp average.
Type of modulation.....Frequency.
Transmitter output power.....1.0 to 4.0 W.
Type of squelch.....Tone operated by 150 Hz signal.
Distance range.....5 mi (8 km) (varies with conditions).

Types of antennas:
Short antenna.....Antenna AT-892/PRC-25; 3 ft long, semirigid steel tape.
Long antenna.....Antenna AT-271A/PRC; 10 ft long, multi-section whip.
Power source.....Battery, Dry BA-5598/U, BA-4386/U, or BA-398/U.
Battery life.....60 hr (with a 9:1 receive-transmit ratio).

D-11. **Items Comprising Operable Equipment** (Figure D-3).

A quantity of one each component is provided with the AN/PRC-77. Dimensions and weights of components are provided in paragraph 2-lb. A battery is required to operate the RT-841/PRC-77 (paragraph 1-13). See Appendix C for listing of AN/PRC-77 components including National Stock Numbers.

D-12. **General Description** (Figure D-3).

Radio Set AN/PRC-77 consists of Receiver-Transmitter, Radio RT-841/PRC-77 and minor components. The RT-841/PRC-77 is described in a. below; the minor components in b. below.

a. Receiver-Transmitter, Radio RT-841/PRC-77. The RT-841-PRC-77 consists of the receiver-transmitter, the receiver transmitter case, and Battery Box CY-2562/PRC-25.

(1) The receiver-transmitter is held in the receiver-transmitter case by four captive screws. The CY-2562/PRC-25 is attached to the receiver-transmitter case by two clamps. The complete RT-841/PRC-77, when assembled, is watertight. All controls are located on the front panel. A battery connector projects from the receiver-transmitter and mates with the connector of the battery.

(2) The CY-2562/PRC-25 is a light-weight metal case that protects and houses the battery. The battery sits on foam pads that are attached to the bottom of the CY-2562/PRC-25.

(3) A pressure relief valve is installed in CY2562/PRC-25 to vent hydrogen gas (a by-product of the magnesium battery, BA-4386/U, discharge action) from the CY-2562/PRC-25 and thus prevent the gas from accumulating in the receiver/ transmitter case and exploding. The valve is provided on new equipment and installed in used equipment per modification work order (MWO) 11-5800-212-301 (13 September 1972). The valve is required to prevent injury to personnel and prevent serious damage to the RT-841/PRC-77.

b. Minor Components (Figure D-3).

(1) Antenna AT-892/PRC-25. The AT-892/PRC-25 is a one-section, 3-foot long whip antenna. A spring at its base allows for positioning of the antenna to keep it in a vertical position, regardless of the position of the RT-841/PRC-77. This antenna is used for general short-range service and, because of its steel tape construction, can be folded into a small space.

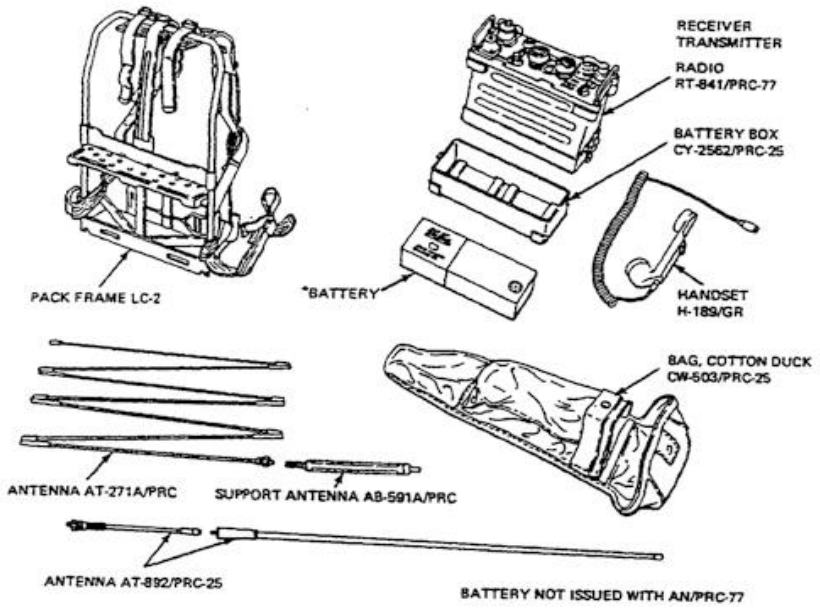


Figure D-3. Radio Set AN/PRC-77 and Components

(2) Antenna AT-271A/PRC. The AT-271A/PRC is composed of six sections; each section fits into the end of a wider section. A stainless-steel, plastic-covered cable (or braided plastic cord), under spring tension, is threaded through the sections to keep them together in the operating condition. When the sections are folded, the cable keeps them together as a group, to prevent the loss of individual sections. Spring tension is provided by a spiral spring in the base section. This antenna is used when maximum range is required.

(3) Support, Antenna AB-591A/PRC. The AB-591A/PRC, which is of rigid tubular construction, is used as a main support of the AT-271A/PRC.

(4) Harness, Electrical Equipment LC-2. The LC-2 is made of cotton duck. It is used to secure the RT-841/PRC-77 so that it can be carried on the operator's back.

(5) Bag, Cotton Duck CW-503/PRC-25. The CW-503/PRC25 is sectionalized into several pockets which are used to store the two antennas, the antenna support, and handset ((6) below) (Figure D-4).

(6) Handset (Figure D-5). Either of the following handsets may be issued with the AN/PRC-77.

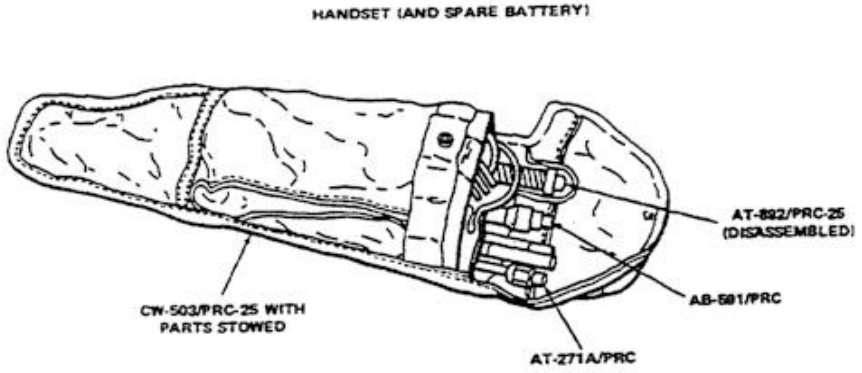


Figure D-4. Bag, Cotton Duck CW-503/PRC-25

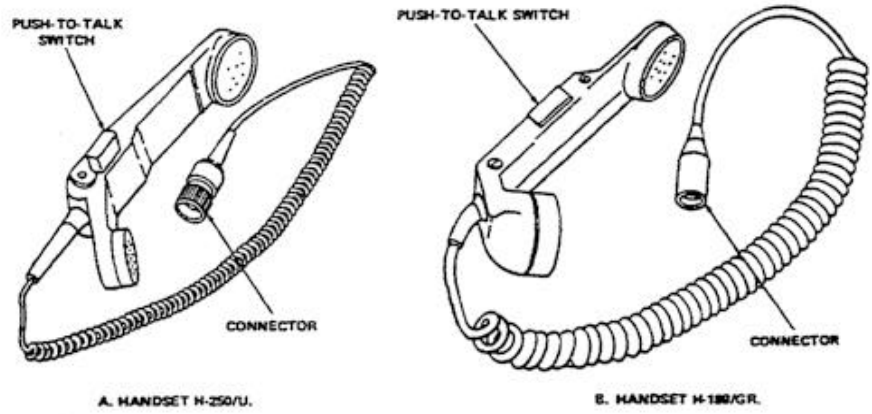


Figure D-5. Handsets H-189/GR and H-250/U

(a) Handset H-189/GR. The H-189/GR contains a dynamic microphone and receiver for transmitting and receiving signals. A push-to-talk switch is mounted in the handle. The connecting cord is retractile and terminates in a five-pin connector.

(b) Handset H-250/U. The H-250/U is similar to the H-189/GR except that it is lighter and more rugged.

D-13. **Additional Equipment Required.**

a. Batteries are not supplied with the AN/PRC-77, but are required for operation of the RT-841/PRC-77. Batteries are issued in accordance with requirements specified in SB 11-6.

(1) Battery, Dry BA-4386/U is a magnesium battery that has long life. The battery is provided with a female connector to mate with the battery connector on the RT-841/ PRC-77. The battery supplies 3 and 15 volts; the 3-volt output is not used by the RT-841/PRC-77.

(2) Battery, Lithium BA-5598/U has longer life than Battery, Dry DA-4386/U, but is half the size (smaller). It is a normal procedure to install two lithium batteries in Battery Box CY-2562/PRC-25. One battery is installed with its receptacle mating with the radio connector. The spare lithium battery is put in the battery box to take up the remaining room and to secure the other battery.

b. For arctic operation, Battery, Dry BA-398/U may be used. See paragraph 6-2 for details. See SB 11-576 for authorization and use of cold weather batteries for the AN/PRC-77 and other radios.

Section IV

D-15. **Unpacking** (Figure D-6).

a. Packaging Data. When packed for shipment, the components of the AN/PRC-77 are placed in an inner carton. A moisture-vapor-proof barrier is placed around the inner carton. This package is placed in an outer carton. The outer carton is covered with a second moisture-vapor-proof barrier and placed in a wooden packing box.

b. Component Dimensions. The wooden packing box is 17 inches deep, 13 inches wide, and 9 3/4 inches high. The weight of the packed equipment is 20 pounds.

c. Removing Contents.

NOTE

When unpacking equipment that is packed only in cartons, omit procedures given in (1) thru (8) below.

(1) Cut and fold back the metal straps.

WARNING

Prevent personal injury when applying or removing steel strapping by wearing heavy gloves and a face shield. Do not handle packing cartons by steel strapping.

CAUTION

Do not pry off boards. Prying may damage equipment.

(2) Remove nails from top and one side of wooden packing box with nail puller.

(3) Open moisture-vapor-proof barrier covering outer carton.

(4) Open outer carton. Open second moisture-vapor- proof barrier covering inner carton.

(5) Remove and open inner carton.

(6) Remove corrugated filler.

(7) Remove and open envelope that contains technical manuals.

(8) Remove major and minor components.

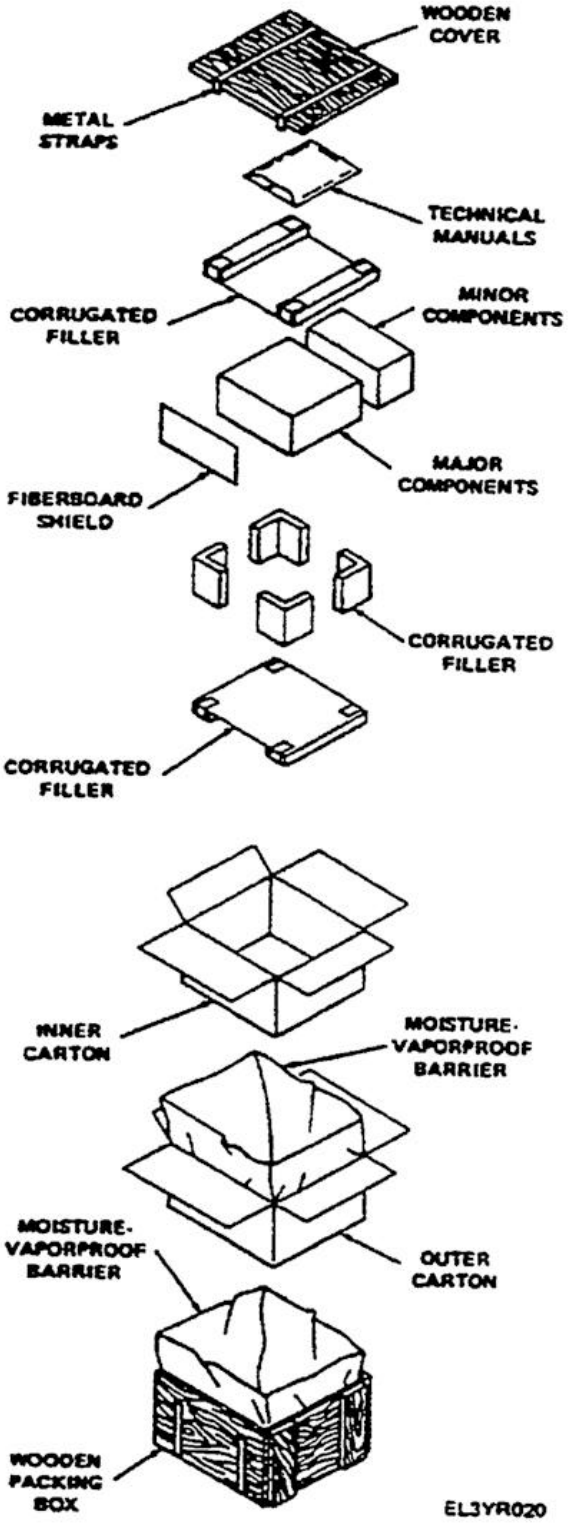


Figure D-6. Typical Packaging

D-16. **Checking Unpacked Equipment.**

a. Inspect the equipment for possible damage incurred during shipment. If the equipment has been damaged, report the damage on Form SF 364 (Paragraph 1-3).

b. Check to see that the equipment is complete as listed on the packing slip. If the packing slip is not available, check the equipment against the components list (Appendix C). Report shortages on SF 361 per AR 735-11-2. Shortage of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

c. If the equipment has been used or reconditioned, check to see if it has been changed by an MWO. If the equipment has been modified, the MWO number will appear on the front panel, near the nomenclature plate. Check to see if the MWO number (if any) and appropriate notations concerning the modification have been entered in the equipment manual. Current MWO's applicable to the equipment are listed in DA Pam 320-1.

D-17. **Siting.**

The AN/PRC-77 operates at low power and on high frequencies; therefore, the location of the equipment greatly affects its operating range (distance). Normally, a line-of-sight range can be expected; that is, if the other station can be seen, satisfactory operation is probable. An intervening hill or a tall building may hamper or prevent contact with other stations. Valleys, densely wooded areas, and low places are poor sites. Location on a hilltop or a tower will increase operating distance. If possible, avoid locations near a source of electrical interference, such as power or telephone lines, radar sets, and field hospitals.

D-18. **Installation and Removal of Battery** (Figure D-9 and D-10).

NOTE

When using the new BA-5598/U Lithium batteries, ensure that two additional pads have been added to the battery box to prevent movement of batteries.

a. Stand the RT-841/PRC-77 on a level surface with its front panel facing downward.

b. Release the two clamps by pushing the top-most part of each clamp down and away from the receiver-transmitter case.

c. Remove the CY-2562/PRC-25 and remove the battery.

d. Inspect the radio connector; if it is damaged or loose, the receiver-transmitter must be repaired. Tighten the pressure test screw if it is not sealed with an epoxy (Appendix E, Item 4). Tighten the pressure relief valve.

e. Position the new battery connector in line with the radio connector until the two connectors are mated.

f. If Battery, Lithium BA-5598/U is used, install a spare 13A-5598/U to take up the remaining room and secure the other battery.

WARNING

Lithium type batteries may be used with your equipment. These batteries are potentially dangerous if misused or tampered with before, during, and after discharge. The following precautions must be strictly observed to prevent possible injury to personnel or damage equipment:

DO NOT **crush, puncture, disassemble, or otherwise mutilate the batteries.**

DO NOT **heat or incinerate the batteries.**

DO NOT **short circuit.**

DO NOT **try to recharge.**

DO NOT **bypass any internal fuse or replace the fuse with a fuse of a different rating. If the battery uses replacement fuses, they will be packed two for every ten batteries.**

DO NOT **use carbon dioxide extinguishers on exposed lithium metal fires. Flood the burning material with water or use graphite-type compounds or graphite-type extinguishers to extinguish burning lithium. You can tell the difference between Magnesium Battery Ba-4386/U and Lithium Battery BA-5598/U by looking at their size. The Lithium battery is half the size of (smaller than) the Magnesium battery. Magnesium batteries shall be turned in to the Defense Reutilization and Marketing Office (DRMO) for disposal.**

DO NOT **use batteries which look bulged or have burst. Turn these batteries into the Defense Reutilization and Marketing Office (DRMO).**

DO NOT **store equipment during periods of disuse in excess of 30 days.**

TURN OFF **the equipment if you feel the battery (hissing sound), or smell irritating sulfur dioxide gas (pungent, irritating fumes). Wait 30-60 minutes for the battery to cool before removing. Remove the battery from the battery box (CY-2562/PRC-25) when the radio is not in use. this is required to ensure that dangerous gasses do not accumulate. Personnel can be injured and equipment damaged if the boxes explode. Magnesium battery BA-4386/U does not require refrigeration before its initial use to retain its power. Store the battery in a cool and moisture-free place. This procedure will prolong its useful life. If stored in a warm or damp place, the battery may swell.**

g. Install the CY-2562/PRC-25 on the receiver-transmitter case and tighten the two clamps.

h. Battery power may be checked using Battery Test Set AN/PSM-13 (TM 11-6625-823-15; SB 11-623) with Connector, Adapter U-410.

NOTE

Battery Test Set AN/PSM-13 shall only be used to test Magnesium Battery BA-4386/U. This test will result in an inaccurate reading if used to test the Lithium Battery BA-5598/U.

i. Observe the following procedures to dispose of a worn-out battery:

(1) Do not compact or incinerate the battery.

(2) Do not dispose of the battery in streams, rivers, oceans, etc. Shipboard users will retain the battery for shore disposal.

j. All batteries shall be turned into the Defense Reutilization and Marketing office (DRMO) for disposal.

D-19. **Assembly and Installation for Man-Pack Operation.**

a. Attach the LC-2 (Figure D-7) to the receiver-transmitter as instructed in (1) thru (4) below.

NOTE

Install the battery in the receiver-transmitter before proceeding.

(1) Place the LC-2 flat on a level surface with the cargo shelf facing up.

(2) Place the receiver-transmitter on the LC-2 with its front panel toward the top and the CY-2562/PRC-25 resting on the cargo shelf of the LC-2.

(3) Fasten the RT-841/PRC-77 to the LC-2 with the two cargo tiedown straps. Hook the metal end of the strap into the buckle. Then feed the cloth end through the center slot on the buckle, then down through the end slot. Tighten strap, then snap down buckle to secure.

(4) Clip the CW-503/PRC-25 (cotton bag) to the upper cargo tiedown strap.

b. Mount the LC-2 on the operator as follows (Figure D-8).

(1) Install the desired antenna.

(2) Connect the H-189/GR (handset) to one of the AUDIO connectors on the front panel of the RT-841/PRC-77.

(3) Place the LC-2, with the RT-841/PRC-77 attached, on the operator's back. Place the shoulder straps over the operator's shoulders.

(4) Hook the quick-release buckle on each shoulder strap and snap down the cover strap on each.

(5) Fasten the waist straps.

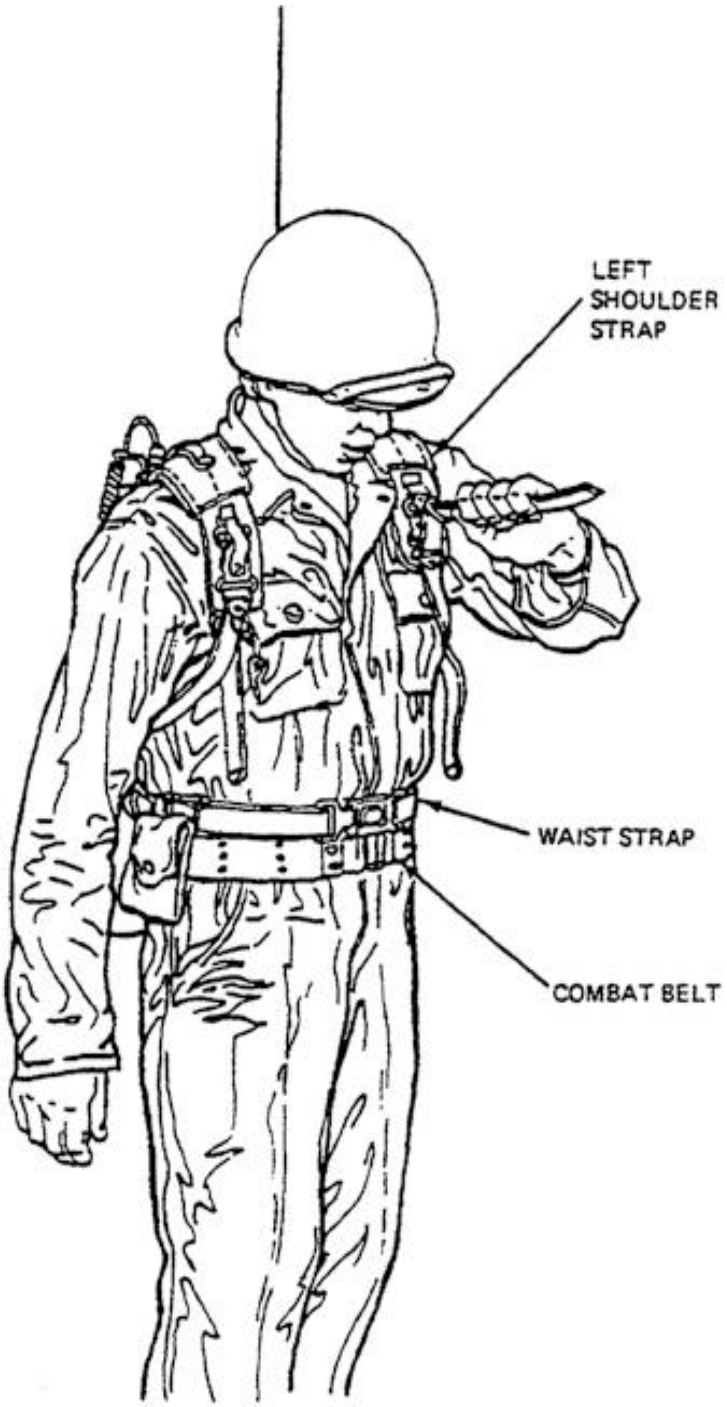


Figure D-8. Installing AN/PRC-77 for Man-Pack Operation

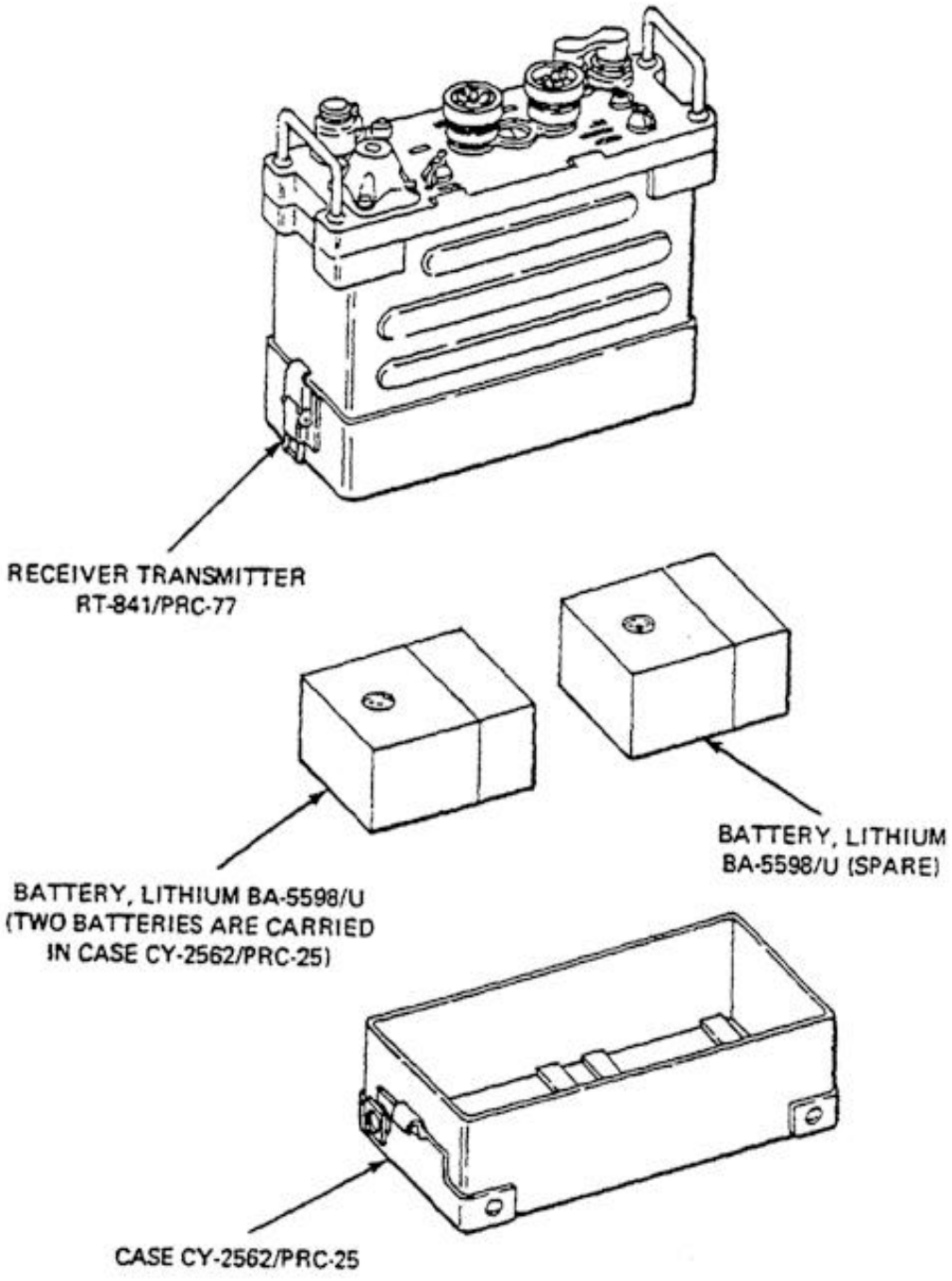


Figure D-9. Installation of Battery, Lithium BA-5598/U

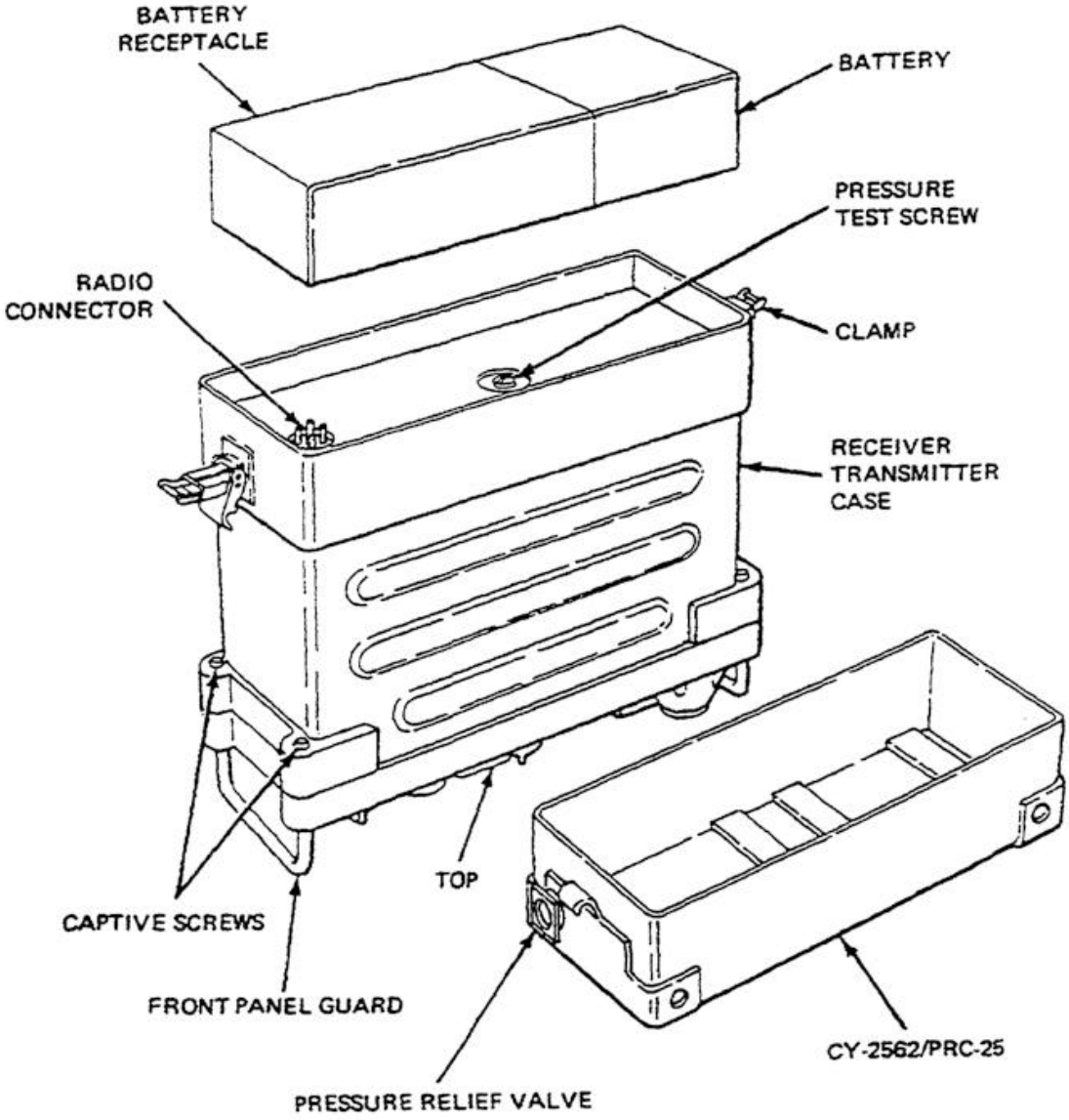


Figure D-10. Installation of Battery, Magnesium BA-4386/U

D-20. **Installation of Antennas.**

Use the long, 10-foot AT-271A/PRC when maximum range is required. Use the short, 3-foot AT-892/PRC-25 when maximum range is not required.

CAUTION

If as little as 1/16 gap is allowed between the top of the whip antenna receptacle and the flat bottom of the antenna, the antenna may break at this point, receptacle. A plastic filling has been included among the threads but it may become worn and ineffective in preventing the antenna, periodically tighten it in the antenna receptacle.

a. Antenna AT-271A/PRC.

(1) Check to see that the tip is securely screwed to the top element and that the threaded stud at the other end is securely screwed to the bottom element.

(2) Remove the cover from the whip ANT receptacle.

(3) Screw Support, Antenna AB-591/PRC-25 into the whip ANT receptacle.

(4) Extend the AT-271A/PRC by holding the base section (the heaviest section) and carefully whipping it outward. If all sections are not secure, repeat this procedure, or insert the sections individually by hand.

(5) Screw the extended AT-271A/PRC into the AB-591/PRC-25.

b. Antenna AT-892/PRC-25.

(1) Remove the cover from the whip ANT receptacle.

(2) Screw the blade section securely to the spring base section. Screw the spring base section securely to the whip ANT receptacle.

NOTE

When folding the AT-892/PRC-25, always fold the blade section toward the concave (curved in) side.

(3) The AT-892/PRC-25 spring base section permits positioning of the antenna at any angle other than vertical to the top of the receiver-transmitter. For best communication, the antenna should be vertical to the ground (A and B, Figure D-11). When the operator or the transmitter is in a position other than vertical to the ground, the antenna should be adjusted so that it is vertical to the ground.

If the vertical position would reveal the operator's position, the antenna can be positioned so that it is horizontal to the ground (C, Figure D-11). Under this situation, the direction of communication is broadside to the antenna.

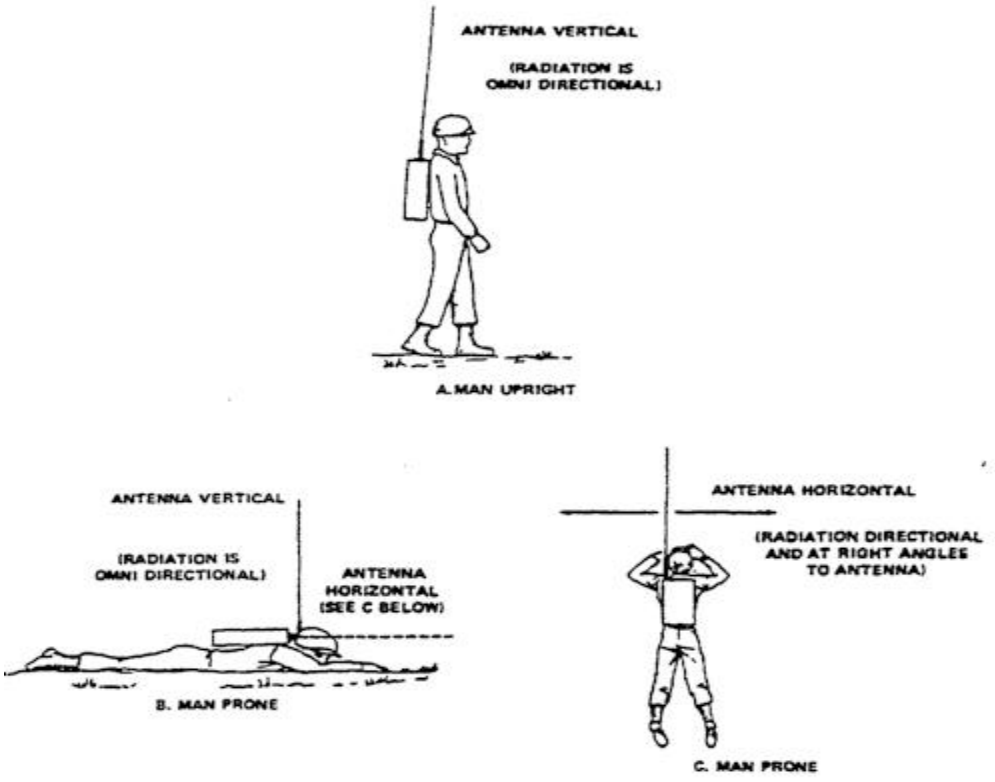


Figure D-11. Orientation of AT-892/PRC-25 in Various Positions on User

c. Other Antennas.

(1) For long-distance operation, refer to paragraph D-3 for information on Antenna Equipment RC-292 and Antenna Group OE-254/GRC.

(2) To detect other radio stations, refer to paragraph D-4 for information on the use of Antenna, Homing Loop AT-784/PRC.

(3) To use a long-wire antenna, refer to paragraph D-5 for information on Antenna AT-984A/G.

Section V

OPERATING INSTRUCTIONS

CAUTION

DO NOT **change the MHZ and kHz tuning controls or the BAND switch while the radio is keyed for transmission (handset push-to-talk switch depressed). Damage to modules in the radio may result, or the wrong channel frequency may be set up, thus preventing**

radio communication. Battery power should be between 12.5 and 15 volts DC, with plus (+) applied to the B terminal on the battery connector (at the back of the receiver-transmitter) and minus (-) applied to the A terminal. Do not interchange these battery polarities; to do so will result in damage to modules in the radio.

D-21. **Receiver-Transmitter, Radio RT-841/PRC-77, Control, indicators, and Connectors** (Figure D-12).

See (Figure D-12) for controls, indicators and connectors for Receiver-Transmitter, Radio RT-841/PRC-77.

D-22. **Presetting Channel Frequencies** (Figure D-12 and D-13).

On the MHZ and kHz controls (Figure D-12) are preset levers that can be set to catch the stops on each control (Figure D-13). Thus, when two channels are preset, they can be selected without looking at the channel dial (Figure D-12). Use the procedures in a. below to set the kHz control; use the procedures in b. or c. below to set the MHZ control.

NOTE

When presetting the controls, the two frequencies to be set must be considered the lower and the higher frequencies; and the sections of each tuning control as the inner (next to the front panel) and to the outer sections (Figure D-11).

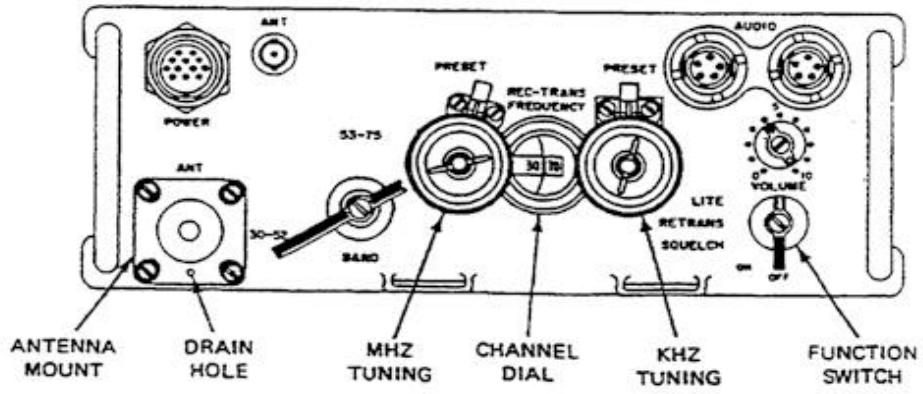


Figure D-12. Receiver-Transmitter, Radio RT-841/PRC-77 Controls, Indicators, and Connectors

a. Presetting kHz Tuning Control. Determine the lower and higher kHz frequencies. (For example: 35 in 59.35 MHZ, 70 in 39.70 MHZ, etc., with 35 as the lower frequency and 70 as the higher frequency).

(1) Set the preset lever away from the kHz control (A and B, Figure D-11).

(2) Set the kHz control so that the lower frequency appears in the channel dial.

(3) Position the preset lever forward against the control, (C, Figure D-13) and loosen the wingnut on the control.

(4) Pull up on the upper section of the control and turn it counterclockwise until the stop on the lower section strikes the preset lever. Tighten the wingnut.

(5) Position the present lever away from the control.

(6) Turn the control until the higher frequency appears in the channel dial (both sections move).

(7) Loosen the wingnut and position the present lever forward against the control.

(8) Without disturbing the setting of the lower section, pull on the upper section and turn it clockwise until its stop strikes the preset lever.

(9) Keeping the upper section against the preset lever, tighten the wingnut.

(10) Check the settings by turning the control counterclockwise to the stop for the lower and higher kHz frequency settings by turning the control counterclockwise to the stop for the lower kHz frequency, and clockwise to the stop for the higher kHz frequency.

(11) Set the MHZ control (b. below).

b. Presetting MHZ Tuning Control. Determine the assigned lower and higher MHZ frequencies. (For example: 59 in 59.35 MHZ, 39 im 39.70 MHZ, etc.).

(1) Presetting MHZ frequencies in same band. The procedure for presetting the lower and upper sections of the MHZ control for MHZ frequencies that are in the same band are the same as those given for the kHz control in a. above. That is, the lower MHZ frequency in the band is set with the lower section of the control; and the higher MHZ frequency in the same band is set with the upper section.

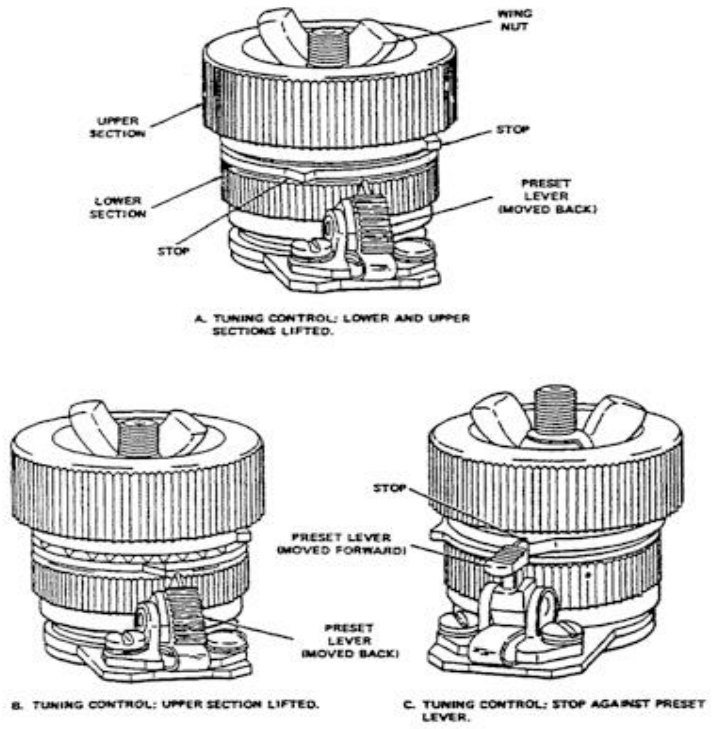


Figure D-13. Presetting MHZ and kHZ Tuning Controls

(2) Presetting MHZ frequencies in different bands. Note that there are 23 positions of the control in each band: from 30 thru 52 in band A; from 53 thru 75 in band B.

(a) When presetting the MHZ control for frequencies that are in different bands, always set the lower section to the MHZ frequency that is lower in its band than the MHZ frequency in the other band. For example: 54 is lower (second position) in band B than 33 MHZ (fourth position) in band A; thus, 54 MHZ would be set on the lower section and 33 MHZ would be set on the upper section.

(b) To preset the MHZ control sections, use the same procedures in a. above with the band switch in the proper position and with the information given in (a) above.

D-23. **Selecting Preset Channels** (Figure D-12 and D-13).

To select a preset channel, proceed as follows:

a. Set the PRESET levers forward (toward the MHZ and kHz tuning controls).

b. Set the BAND switch at 30-52 or 53-75, depending on the channel used.

c. Turn the MHZ and kHz tuning controls until the stops strike against the PRESET levers.

d. Check the channel number that appears in the channel dial.

e. If the incorrect channel appears in the channel dial, turn the tuning controls against the stop in the opposite direction.

f. If the incorrect channel still appears, perform the presetting procedures as given in paragraph D-11 .

g. To select the other preset channel, turn the MHZ and kHz tuning controls against the other stops. If the preset frequency is in the other band, set the BAND switch at the other position.

D-24. **Operating Procedure** (Figure D-12).

a. Set the function switch to ON. A rushing noise should be heard in the handset.

b. Set the BAND switch to 30-52 or 53-75 position, depending on the frequency being used.

NOTE

Do not **change frequencies on BAND switch while the radio is keyed (in transmit mode). When using magnesium battery BA-4386/U, wait approximately 1-2 minutes before transmitting (e. below) to allow battery to develop full power. To obtain best operating range (distance), keep the whip antenna vertical to the ground. Se figure D-11 for various positions the operator can use to keep the short antenna vertical.**

c. Turn the MHZ and kHz tuning controls to display the desired frequency in the channel dial. See the procedures in paragraph 3-3 to select preset channels.

d. Set the VOLUME control at 4; readjust for a desired sound level in the handset.

e. Transmit as follows:

(1) Press the push-to-talk switch on the handset.

(2) Speak into the handset.

NOTE

Do not speak into both elements of the H-138 (*)/U. It has tow microphone elements for noise cancellation; speaking into both elements simultaneously will cancel out your voice.

f. To receive, release the push-to-talk switch on the handset.

g. The receiver rushing noise can be eliminated by setting the function switch to SQUELCH during periods when the other station is not transmitting. Refer to paragraph 3-10 for squelch operation conditions. To determine whether squelch operation is possible, use the following procedures:

(1) Arrange for the distant station to send a short transmission while operating without its squelch.

(2) Set the function switch to ON; the rushing noise should be heard until the other station transmits.

(3) Arrange with the other station to turn its squelch switch to the ON position and to send a short transmission.

(4) On the RT-841/PRC-77 (receiver-transmitter), set the function switch to SQUELCH; the rushing noise should stop and the distant station should be heard when it transmits.

(5) If the other station cannot be heard now, reset the function switch to ON and advise the other station of the situation.

NOTE

The failure of either station to receive transmissions from the other may indicate one of the following:

1. The distance between the stations it too great.

2. One of the other stations has not set the controls to transmit the 150 Hz squelch tone.

3. The squelch circuit of either radio station is defective.

4. Exercise the function switch by setting it in

various positions a few times.

(6) If either station is moving about, leave function switch in the ON position at both stations until it has been determined, by using the procedures in (1) thru (5) above, that reception can be accomplished with the function switch at SQUELCH.

D-24. **Stopping Procedure.**

a. To turn off the receiver-transmitter, set the function switch to OFF.

b. If the AT-271A/PRC was used, disassemble it as follows:

(1) Unscrew the AT-271A/PRC from the AB-591A/PRC (antenna support).

(2) Beginning with the top section, pull out each section from the next section and fold it along the side of the next lower section.

(3) Unscrew the AB-591A/PRC from the antenna mount.

CAUTION

When pulling out each section of the antenna, use only enough force to separate; the sections to avoid breaking the internal cord. Ensure each section has been separated from the next section before folding. Begin with the top section.

c. Store the handset, both antennas, and the AB-591A/PRC in the CW-503/ PRC-25 (cotton bag).

d. Close the flaps on the CW-503/PRC-25.

D-25. Recognition and Identification of Jamming.

Under real or simulated tactical conditions, the receiver may be jammed by the enemy. Jamming is easily done by transmission of a stronger signal on the frequency being used, which makes it difficult or impossible to hear the desired signal. Unusual noises or strong interference heard on the receiver may be enemy jamming, signals from a friendly station, noise from a local source, or a defective receiver. To determine whether the interference is originating in the receiver, disconnect the antenna. If the interference continues, the receiver is defective.

D-26. **Antijamming.**

When jamming of a channel is first noticed, notify your superior officer immediately and continue to operate the equipment. To provide maximum intelligibility of jammed signals, try the suggestions given in a., b., and c. below.

a. The effects of enemy jamming may be reduced by placing the equipment so that nearby obstructions act as a screen in the direction of probable sites of enemy jamming transmitters. This screen action may also reduce the transmitted signal strength toward the enemy and thereby make it more difficult for him to intercept your signals. If possible, try several different locations within the designated area and stay at the one where jamming is minimum.

b. Vary the VOLUME control. The level of the desired signal may be raised enough to be distinguished from the jamming signal.

c. If the procedures in a. and b. above do no provide sufficient signal separation for operation, request change to an alternate frequency and call sign.

D-27. **Operating Procedures Under Arctic Conditions.**

When operating the AN/PRC-77 under arctic conditions, Battery, Dry BA-398/U (para 6-2) must be used instead of the BA-5598/U, BA-386/PRC-25, or BA-4386/U. The BA-398/U (Figure 6-4), which is worn beneath the operator's parka, allows operation in temperatures to 630 F (530 C). Prior to operation in extreme temperatures, check to see that a coating of silicone grease has been applied to the neoprene rubber 0-ring of the audio connectors. (See SB 11-576 for authorization of DA398/U.)

D-28. **Homing Operation.**

Use Antenna, Homing Loop AT-784/PRC (TM 11-5985-284-15) to provide the AN/PRC-77 with facilities for homing operation. Refer to paragraph 6-4 for operation of the AT-784/PRC with the AN/PRC-77.

D-29. **Conditions for Squelch and Non-squelch Operation.**

The explanations and squelch operating conditions in a. through d. below are applicable to the squelch operation in paragraph 3-4g.

a. When the function switch of the RT-841/PRC-77 is set to ON, a rushing noise is heard in the handset. The rushing noise stops when a second RT-841/PRC-77, or another transmitter operating on the same frequency, is turned on.

b. When the function switch is set to SQUELCH, no sound is heard in the handset until a second RT-841/PRC-77 or another transmitter operating on the same frequency, is turned on, provided the other transmitter transmits a 150 Hz squelch signal when it is turned on. Radios provided with this feature are given in c. below. When the RT-841/PRC-77 is turned on for transmission with its function switch set to SQUELCH, a 150 Hz squelch signal is transmitted. This signal is heard as a sidetone buzz in the handset.

c. Communication with the function switch set to SQUELCH is possible when other stations in the radio net are using one of the following radio sets and if these radios also have their squelch switches in the ON positions. In general, when one of the following radio sets has its squelch switch set to the 150 Hz squelch function, the other radio sets in the net must be set similarly.

(1) Radio sets that are equipped with the RT-505/PRC-25, such as Radio Sets AN/PRC-25, AN/VRC-53, AN/VRC-54, and AN/GRC-125.

(2) Radio sets that are equipped with the Receiver-Transmitter, Radio RT-841/PRC-77, such as Radio Sets AN/PRC-77, AN/VRC-64, and AN/GRC-160. The RT841/PRC-77 looks like and operates identically to the RT-505/PRC-25.

(3) Radio sets that are equipped with the Receiver-Transmitter, Radios RT-246/VRC, RT-524/VRC, or Receiver Radio R-442/VRC, such as Radio Sets AN/VRC49, and AN/VRC-54. The 150 Hz squelch tone is transmitted from these radios when their squelch switch is set to NEW *ON,* NEW OFF, and OLD

OFF. When the 150 Hz squelch signal is sent from another radio set, these radio sets will respond when their squelch switch is set to NEW *ON.*

(4) When communication is with Radio Sets AN/ARC-54 and AN/ARC-131, the squelch switch of these radio sets must be set to TONE.

d. To communicate with radio sets other than those listed in c. above, the function switch of the RT-841/PRC-77 must be set to ON.

Section VI

SINCGARS RADIO

D-30. **Assembly and Preparation for Use.** (Referenced TM 11-5820890-10-1, Chap. 2)

a. Scope.

b. Manpack Radio Assembly.

NOTE

Vehicular dismount radios: If you must dismount the radio, do the steps for assembling the manpack radio.

(1) Installation of Lithium Battery and Battery Box. To assemble a manpack radio, you must first check and install the battery.

WARNING

The Lithium Battery used with your manpack radio is hazardous if misused or tampered with before, during, or after discharge. Strictly observe the following precautions to prevent injury to personnel or damage to equipment.

DO NOT **heat, incinerate, crush, puncture, disassemble, or otherwise mutilate battery.**

DO NOT **short circuit, recharge, or bypass any internal fuse.**

DO NOT **store battery in equipment during periods of non-use.**

TURN OFF **equipment immediately if you feel battery case becoming very hot, hear battery venting (hissing or burping), or smell irritating gas (sulfur dioxide). Remove battery only after it cools to the touch; then return it to supply for disposal.**

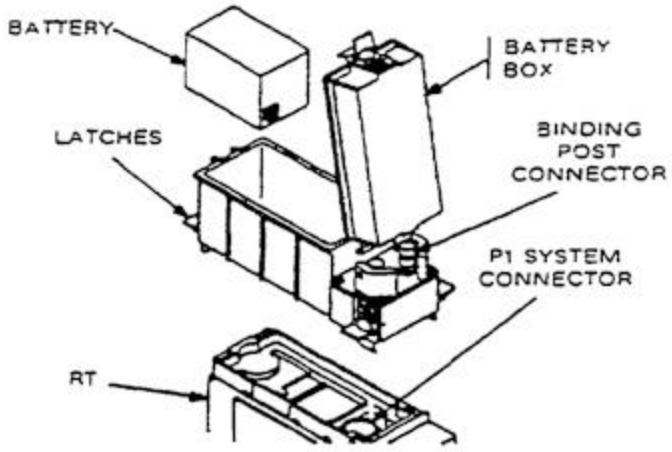


Figure D-14. Installation of Lithium Battery and Battery Box to RT

(a) Visually inspect battery box for dirt and damage. If battery has been previously used, note battery life condition number.

(b) Stand RT on front panel guards; place battery box on RT. Secure using latches.

(c) Check battery life condition (written on battery if battery is not new).

(d) Write down number (for later entry into radio).

(e) Place battery in battery box and mate connectors.

(f) Close battery box cover and secure using latches

(g) Return radio to upright position.

(h) If used battery was installed, enter the battery life condition into the radio by performing the following:

1 Set FCTN to LD.

2 Press BATT; then CLR.

3 Enter number recorded on side of battery.

4 Press STO.

5 Set FCTN to SQ *ON.*

(2) Antenna.

CAUTION

Do not use antenna as a handle. Equipment damage may result.

(a) Screw whip into antenna base.

(b) Hand tighten.

(c) Carefully mate antenna base with RT ANT connector.

(d) Hand tighten.

(e) Position antenna as needed by bending goose neck.

NOTE

Keep antenna straight up if possible. If the antenna is bent to a horizontal position, it may be necessary to turn the radio in order to receive and transmit messages.

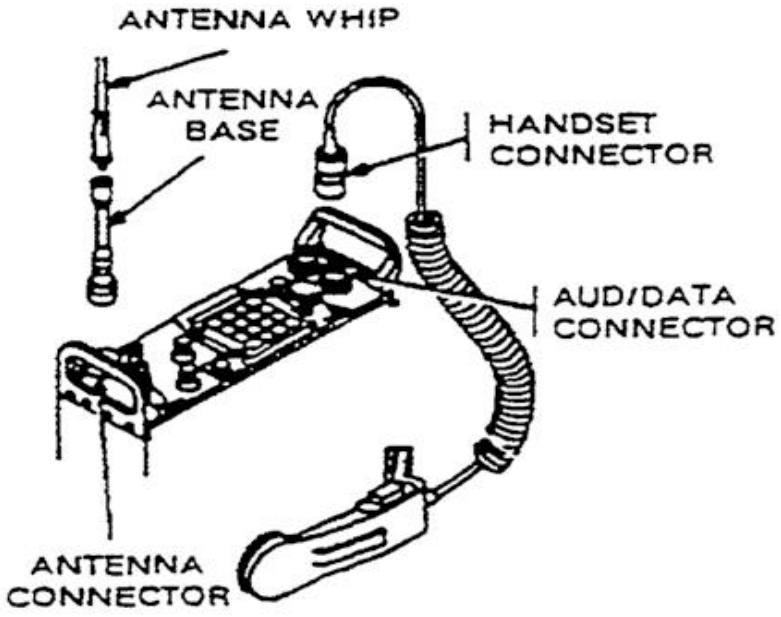
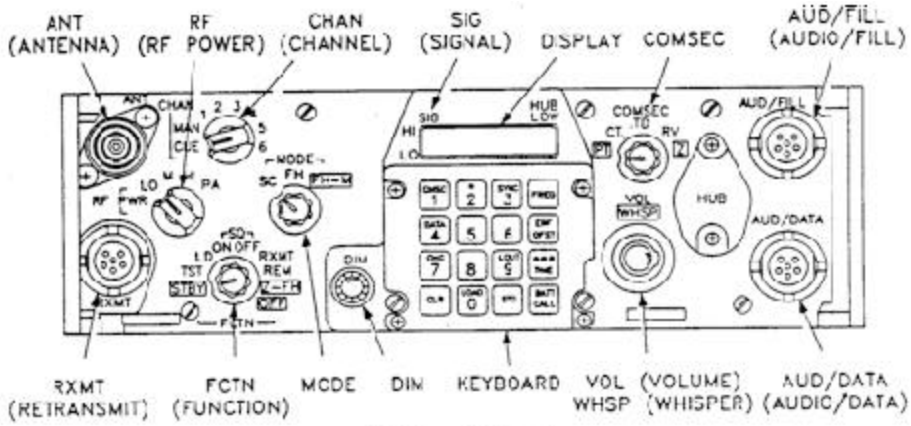


Figure D-15 Installation of Antenna and Handset

D31. **Single Channel Operating Procedures.**

a. Operation in Single Channel. You must load your RT with one or more SC frequencies.



RT Front Panel

Figure D-16. RT Front Panel

b. Loading Frequencies. The procedure for loading SC frequencies requires setting the proper switches, pressing the correct number keys for the frequency you wish to load, and storing the load in RT permanent memory by pressing STO button.

(1) Obtain authorized operating frequency from SOI or *NCS.*

(2) Refer to the illustration of RT front panel above; then set FCTN to LD.

(3) Set MODE to SC.

(4) Set CHAN to MAN, CUE, or desired channel (1-6) where frequency is to be store.

(5) Press FREQ (display will show 110000011, or to frequency RT is currently tuned).

(6) Press CLR (display will show five lines).

(7) Enter the numbers of the new frequency (using keyboard buttons)

NOTE

If you make a mistake while entering a frequency, press CLR. This action will delete the last digit entered.

NOTE

MP operators: It is important that you enter another number, or store the frequency within seven seconds. Otherwise, the display will go blank and you will have to re-enter the numbers. If you require more than seven seconds to perform a step, continue to press the last button, and the seven second clock will be stopped.

(8) Press STO (display will blink and show the frequency you just stored).

(9) Repeat steps a thru h for additional frequencies that you wish to load.

(10) Set FCTN to SQ ON (on normal operating position).

c. Clearing SC Frequencies. If you wish to clear a frequency from the RT, you must perform the following procedure using the correct switch settings and pressing FREQ, CLR, LOAD, and STO. When no frequency is desired, pressing STO stores no frequency in the RT permanent memory.

(1) Set MODE to SC.

(2) Set CHAN to MAN, CUE, or desired channel where frequency is to be cleared.

(3) Press FREQ.

(4) Press CLR.

(5) Press LOAD; then press STO.

(6) Set FCTN to SQ ON (on normal operating position).

d. Loading Offset Frequencies. It may be necessary to offset an SC frequency that is loaded in your RT. Your NCS will direct you to offset your SC frequency when it is necessary. This procedure allows you to change the SC frequency by plus or minus 5 MHZ or plus or minus 10 MHZ.

(1) Set FCTN to SQ *ON.*

(2) Set CHAN to MAN, CUE, or desired channel (1-6) to be loaded with offset.

(3) Press FREQ, OFST, and CHG.

(4) Continue to press CHG until desired offset is displayed.

e. Clearing offset Frequencies. When you wish to clear the SC frequency of the offset, simply continue to press CHG until 11001, is displayed. The SC frequency will return to the original frequency before the offset was loaded.

NOTE

If no offset is desired, press CHG until "00" is displayed.

D-32. **Assemble and Operate a SINCGARS Radio in the Single Channel Unsecure Mode (Ref, TM 11-5820-890-10-1, Chap 2, Secs, II & III)**

STANDARD: The candidate will be given a SINCGARS radio (AN/PRC-119A), handset, antenna base, whip antenna, a new battery, an operating frequency, a call sign, and the receiving station's call sign. The candidate must assemble the radio, set the operating frequency for single channel unsecure operation and perform a radio check with five minutes.

a. Performance Measures

(1) Installs battery.

(2) Screws whip antenna into antenna base hand tight.

(3) Screws antenna base into RT ANT connector hand tight.

(4) Connects handset connector to AUD/DATA connector.

(5) Sets FCTN switch to LD, MODE switch to SC, CHAN switch to position one. COMSEC switch to PT and PWR switch to HI.

(6) Presses FREQ then CLR on the keyboard.

(7) Enters the given frequency on the keyboard and presses STO on the keyboard with seven seconds of step 6.

(8) Sets the FCTN switch to SQ ON.

(9) Performs a radio check using correct radio procedures and prowords.

(10) Completes the task within five minutes.

b. System Improvement Program (SIP)/Advanced System Improvement Program (ASIP) Receiver-Transmitter (RT)

(1) Enhanced Data - The SIP/ASIP RT offers enhanced Data rates of 1200N, 2400N, 4800N, and 9600N bits per second (BPS), where the "N" indicates new or enhanced rates. The advantages of these enhanced data rates are better accuracy, great speed, longer range, and improved forward error correction.

(2) New Data Modes - Two new data modes are also provided: Packet (PCKT), which supports operations involving Force XXI Battle Command Brigade and Below (FBCB2) hardware and software, and RS-232 by which data messages can be sent from SIP/ASIP RT to SIP/ASIP RT using computers and commercial "Xmodem" communications software, a widely used file transfer protocol.

(3) RCU Function - The SIP/ASIP RT can be used as a remote control unit by merely selecting the remote control unit ("RCU") option under the [RCU] key of the SIP/ASIP RT keypad. The RCU, C-1 1561, can still be used to remotely control a SIP/ASIP radio for voice and SINCGARS data modes, but it cannot be used for enhanced data modes.

(4) GPS Time Loading - A feature of the SIP/ASIP RT is the ability to load global positioning system (GPS) time from an attached precision lightweight GPS receiver (PLGR) using the very simple procedure.

(5) Internal FSK Detector - The SIP/ASIP RT contains an internal FSK detector circuit for use with the "AD1" and "TF" data rates. Use of a special CX-13808/U DMD interface cable is no longer necessary. In addition, TACFIRE devices must be cabled directly to the SIP/ASIP RT AUD/DATA connector.

c. SIP/ASIP RT Keypad

(1) General - The keypad of the SIP/ASIP radio is similar to that of earlier versions except four of the keys have been given new designations: RCU, GPS, Situational Awareness (SA), and combat identification (CID). The ASIP keypad adds a MENU and Backlight function. Each is explained below.

(2) RCU/(2) - The RCU key is used to select operating mode options of RT, RCU, EXT, or LDE. RT is the normal employment of the RT as a receiver-transmitter. Selecting RCU allows the SIP/ASIP RT to be used as a remote control device. EXT, is a capability of the SIP/ASIP that allows the radio to be controlled externally via the system connector. The ASIP radio is automatically in EXT when proper interface and software is detected. Selecting EXT disables the front panel controls of the RT EXT is used for GRM-1 22 testing. LDE stands for local data entry and represents a future capability of the SIP/ASIP RT to

communicate with IP/ASIP VAA regarding data loads and requirements. This feature is currently not used.

(3) GPS/(5) - The GPS key is not used; it represents a possible future capability of the SINCGARS SIP/ASIP radio.

(4) SA/(6) - The SA key is not used; it represents a possible future capability of the SINCGARS SIP/ASIP radio.

(5) CID/(8) - The CID key is not used; it represents a possible future capability of the SINCGARS SIP/ASIP radio.

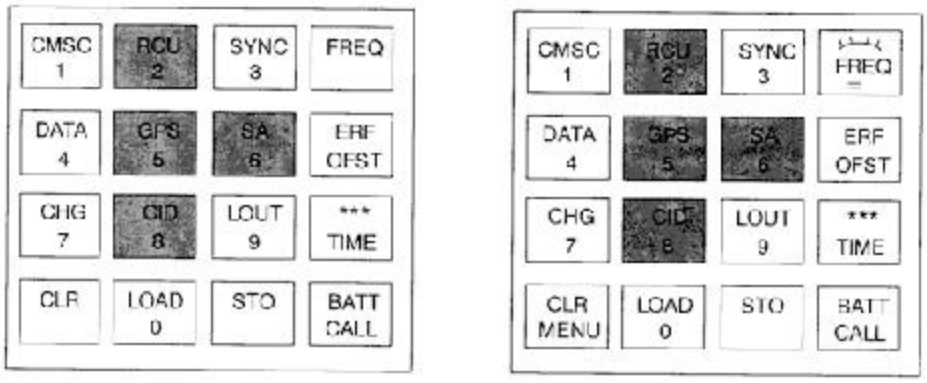


Figure D-17. SIP/ASIP Keypad.

(6) CLR/MENU - MENU appears on SINCGARS ASIP when key is pressed. Multiple presses will scroll MENU.

(7) FREQ/BACKLIGHT - ASIP radio must be in SQ ON, press key [FREQ], then CHG to change intensity.

d. SIP/ASIP vehicular amplifier adapter (VAA)

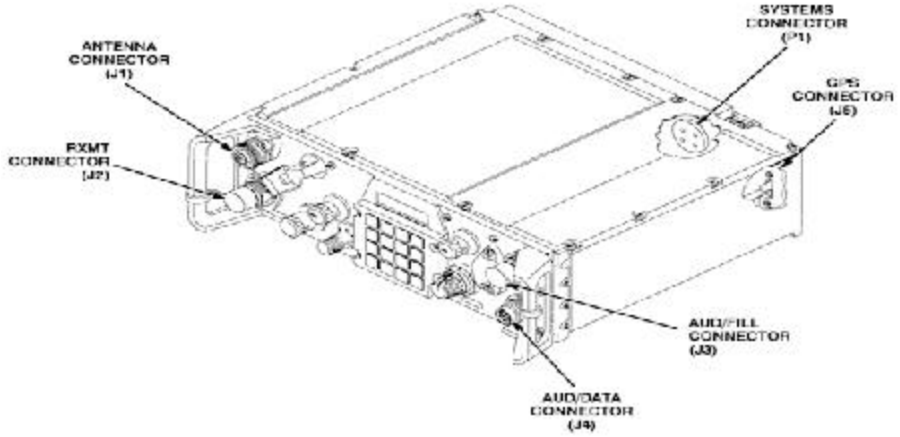


Figure D-18. SIP RT Connectors.

(1) Memory - The SIP/ASIP VAA contains a small microprocessor which allows data in the form of routing tables to be stored in the SIP/ASIP VAA.

(2) Internet - When used in conjunction with FBCB2 hardware and software, the SIP/ASIP VAA supports internet communications among SINCGARS FH nets and between SINCGARS and EPLRS nets. Employment of the internet feature requires that the SIP/ASIP RT be set to the Packet data mode.

e. Connectors, SIP RT

(1) P1 (System) - The P1 systems connector is located on the back of the SIP RT. This connector provides RT power and signaling interfaces.

(2) J5 (GPS) - Located on the back of the SIP RT, the GPS J5 connector provides an interface of the VAA GPS connector.

(3) J4 (AUD/DATA) - The J4 (AUD/DATA) connector supports general data communications at SINCGARS Data Rates of 600, 1200, 2400, 4800 and 16,000 BPS and Enhanced Data Rates of 1200N, 2400N, 4800N, and 960ON BPS. The RS-232 interface allows transmission of data via SINCGARS SIP radios using computers and commercial "Xmodem" software. If not using Packet (PCKT) data mode, or the internet controller (INC) feature of the SIP radio, all data devices must be connected to the AUD/DATA port, not to the SIP VAA.

(4) J3 (AUD/FILL) - Handsets used with the SIP RT may be connected to the AUD/DATA or AUD/FILL connector. (NOTE: Handsets will not function if connected to the front of the SIP VAA).

f. Connectors, ASIP RT

(1) P1 (System) - This connector provides RT power and signaling interfaces.

(2) J6 (Auxiliary) - Used to connect handheld remote control radio device (HRCRD) handset and two-wire adapter.

(3) J5 (GPS) - Enables a PLGR to be connected to a manpack radio.

(4) J3 (AUD/DATA) - The J4 (AUD/DATA) connector Supports general data communications at SINCGARS Data Rates of 600, 1200, 2400, 4800 and 16,000 BPS and Enhanced Data Rates of 1200N, 2400N, 4800N, and 9600N BPS. The RS-232 interface allows transmission of data via SINCGARS ASIP radios using computers and commercial "Xmodem" software. If not using Packet (PCKT) data mode, or the internet controller (INC) feature of the ASIP radio, all data devices must be connected to the AUD/DATA port, not to the ASIP VAA.

(5) J2 (AUD/FILL) - Handsets used with the ASIP RT may be connected to the AUD/DATA or AUD/FILL connector. (NOTE:

Handsets will not function if connected to the front of the ASIP VAA.)

(6) J1 (Antenna) - RF Input/Output.

g. RT Messages

(1) "CALL" - This message appears in the display of a remoted radio when an RCU(RT) operator presses the CALL key, and at the RCU (RT) when the remoted radio operator presses the CALL key.

(2) "EXT" - If your radio has been set to EXT, as an option of the RCU key menu, an "EXT" message will be displayed. All RT front panel controls except COMSEC are disabled. Unless you want to use the EXT feature, use the RCU key to turn EXT mode off. The ASIP RT is always in an EXT mode as long as it detects proper interface and software, EXT will not be displayed.

(3) "Fail 5" - If a "Fail 5" message is displayed during power-up and BIT, it means one of three things:

(a) You have an ANCD or other fill device connected to the RT Disconnecting the fill device will correct the FAIL 5 situation.

(b) You have mistakenly set the COMSEC switch to Z. Moving the COMSEC switch to another position will correct the FAIL 5 situation.

(c) The RT tamper switch has been activated or there is a hard COMSEC failure, in which case you need to see your unit maintainer.

(4) "Fail 6" - This message applies to INC and Frequency Hopping Multiplexer (FHMUX) failures.

(5) "G" - When GPS time has been successfully loaded into the SIP/ASIP radio, the letter "G" will be displayed. When a radio loaded GPS time is returned to SQ ON from STBY, a blinking "G" indicates that GPS time needs to be reloaded. Disappearance of the "G" indicates that the radio is no longer using GPS time.

(6) "GOPT" - Indicates that the SIP/ASIP radio has experienced a COMSEC failure; operator must change to PT in order to continue to communicate.

(7) "GOTST" - When this message appears, it indicates a COMSEC problem. The radio will not transmit, receive, or fill until built in test (BIT) has successfully run. If you cannot get the RT to run BIT successfully, action by unit maintenance is needed.

(8) "NOGPS" - This message appears when attempting to load GPS time without a GPS device (PLGR) attached.

(9) "NOKEY" - If you power-up your radio in CT when there are no COMSEC keys loaded, a "NOKEY" message will be displayed and a COMSEC

alarm will be heard. Setting COMSEC to PT or loading a COMSEC key will clear the alarm.

(10) "PT RX" - This message will be displayed whenever you have your radio in CT and receive a PT message.

(11) "SETDR" - For transmission operation, this message tells the RXMT operator who selects RS-232 that an enhanced data mode (EDM) data rate (1200N, 2400N, 4800N, or 9600N) must be selected before RS-232 transmissions can be started. (NOTE: All SIP/ASIP radios using RS-232 mode must be set to the same EDM data rate.)

(12) "WAIT" - This message is displayed while BIT is running, changing to the message "GOOD" when BIT is successful.